R E M A R K S

Claims 1 through 28 were presented for examination. Claims 1, 2, 5, 6, 8, 9, 12, 13, 15, 16, 19, 20, 22, 23, 26, and 27 were rejected. Claims 3, 4, 7, 10, 11, 14, 17, 18, 21, 24, 25, and 28 were objected to.

Claims 1 and 6 have been amended to overcome the 35 USC 101 rejection, and as a result, claims 3 and 4 have been amended to maintain proper antecedent basis. Support for the aforementioned amendments can be found in paragraphs [0062] and [0067] of the application as filed.

Additionally, claim 7 has been amended to correct claim dependency, per the claims objection identified in the Office action.

The applicant respectfully overcomes the 101 rejection of claims 1, 5, 6, and 7, traverses the 101 rejection of claims 8, 12-15, 19-22, and 26-28, and traverses the 102 rejection of claims 1, 2, 6, 8, 9, 13, 15, 16, 20, 22, 23, and 27. The applicant requests reconsideration in light of the following comments.

Claim Objection

Claim 7 was objected to because the claim was incorrectly dependent upon claim 5. The applicant has amended claim 7 to be correctly dependent upon claim 6.

35 U.S.C. 101 Rejection of Claims 1, 5-8, 12-15, 19-22, and 26-28

Claims 1, 5 through 8, 12 through 15, 19 through 22, and 26 through 28 were rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The applicant respectfully overcomes the rejection of claims 1, 5, 6, and 7, and traverses the rejection of claims 8, 12-15, 19-22, and 26-28.

Claim 1, as amended, recites:

> **1.** A method comprising:
>
> dividing an executable software program into an executable image, a data image, and an execution history image;
>
> *storing said executable image, said data image, and said execution history image into a memory*; and
>
> classifying a first statement in said execution history image into one of a mutable statement and an immutable statement.
>
> (*emphasis supplied*)

The applicant has amended claim 1 to recite the storing of the executable image, the data image, and the execution history image into a memory. Based on the comments in the Office action, it is believed that the change made to claim 1 overcomes the rejection.

Since claim 5 is dependent upon claim 1, the applicant respectfully submits that the rejection of claim 5 is also overcome.

Claim 6, as amended, recites:

> **6.** A method comprising:
>
> dividing an executable software program into an executable image, a data image, and an execution history image;
>
> *storing said executable image, said data image, and said execution history image into a memory;*
>
> executing executable statements, local constants, and singly de-referenced pointers in said executable image; and
>
> processing data, data write-backs, and data read-backs in said data image, wherein said data image is accessed from said executable image using a computed offset into said data image from said executable image
>
> (*emphasis supplied*)

The applicant has amended claim 6 to recite the storing of the executable image, the data image, and the execution history image into a memory. Based on the comments in the Office action, it is believed that the change to claim 6 overcomes the rejection.

It was unclear in the Office action whether it was intended that claim 7 be rejected on account of 35 USC 101. The rejection is suspect because claim 7 recites the logging of the usage of the first statement; in other words, a tangible result is produced. In any event, since claim 7 is dependent on amended claim 6, the applicant respectfully submits that the rejection of claim 7 is also overcome.

With respect to the remaining claims that were rejected per 35 USC 101, the Office action asserts that claims 8, 12 through 15, 19 through 22, and 26 through 28 "are directed to a *method*..." The applicant respectfully submits that these claims are not directed to a method, but in fact are directed to a *machine* (*i.e.,* "an apparatus" as recited in claims 8-21) and to *a manufacture* (*i.e.,* "a machine-readable medium" as recited in claims 22-28).

For the Office's convenience, the three relevant passages from the *Manual of Patent Examining Procedure* (MPEP) are cited here:

> "Note that an apparatus claim with process steps is not classified as a 'hybrid claim'; instead, it is simply an apparatus claim including functional limitations." (MPEP 2106 IV B)

> "When a computer program is recited in conjunction with a physical structure, such as a computer memory, USPTO personnel should treat the claim as a product claim." (MPEP 2106.01 I)
>
> "USPTO personnel should determine whether the computer program is being claimed as part of an otherwise statutory manufacture or machine. In such a case, the claim remains statutory irrespective of the fact that a computer program is included in the claim." (MPEP 2106.01 I)

In the subject claims, a set of tasks (*i.e.,* dividing a software program, and so forth) that are capable of being executed by a computer are recited. The applicant respectfully submits that the machine and manufacture claims in the instant application are statutory subject matter under 35 USC 101, and the fact that a computer program is recited as part of the subject claims does *not* render those claims nonstatutory.

Therefore, the applicant respectfully traverses claims 8, 12 through 15, 19 through 22, and 26 through 28, as far as the 35 USC 101 rejection is concerned.

35 U.S.C. 102 Rejection of Claims 1, 2, 6, 8, 9, 13, 15, 16, 20, 22, 23, and 27

Claims 1, 2, 6, 8, 9, 13, 15, 16, 20, 22, 23, and 27 were rejected under 35 U.S.C. 102(e) as being anticipated by Narayanan, U.S. Patent Pub. No. 2003/0217277, published November 20, 2003 (hereinafter "Narayanan"). The applicant respectfully traverses the rejection.

Claim 1 recites:

> **1.** A method comprising:
>
> *dividing an executable software program into an executable image, a data image, and an execution history image*;
>
> storing said executable image, said data image, and said execution history image into a memory; and
>
> classifying a first statement in said execution history image into one of a mutable statement and an immutable statement.
>
> (*emphasis supplied*)

Nowhere does Narayanan teach or suggest, alone or in combination with the other references, what claim 1 recites – namely dividing an executable software program into an executable image, a data image, and an execution history image.

The present invention is distinct from Narayanan in that Narayanan relies on identifying the stack calls and returns, as these must be encrypted. Narayanan then relies on overwrites of the return stack to produce nonsense machine language instructions or on a cryptographic verification of the return stack. In either case, the executable is disabled.

The technique of the present invention seeks to prevent buffer overflow attacks in a different way than does the technique disclosed by Narayanan. In particular, the present invention stores its data and executables in different copies of the software image. As a result, a stack over-run will be allowed to occur, <u>but only in the data copy</u>. Since execution occurs from the other copy that has not been over-written, no return stack corruption occurs, and the stack over-run attack can be disabled. In contrast, Narayanan <u>never suggests dividing the executable software program into the images</u>.

Another embodiment of the present invention features a combination of evaluating the executable and <u>maintaining execution histories to identify and classify the contents</u> (executables, pointers, data, mutable and immutable data). In contrast, Narayanan <u>never discloses an execution history image</u>.

For these reasons, the applicant respectfully submits that the rejection of claim 1 is traversed.

Because claims 2 through 5 depend on claim 1, the applicant respectfully submits that the rejection of claim 2 and objection of claims 3 and 4 are also traversed.

Claim 6 recites:

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6. A method comprising:

dividing an executable software program into an executable image, a data image, and an execution history image;

storing said executable image, said data image, and said execution history image into a memory;

executing executable statements, local constants, and singly de-referenced pointers in said executable image; and

processing data, data write-backs, and data read-backs in said data image, wherein said data image is accessed from said executable image using a computed offset into said data image from said executable image

(*emphasis supplied*)

Nowhere does Narayanan teach or suggest, alone or in combination with the other references, what claim 6 recites – namely <u>dividing an executable software program into an executable image, a data image, and an execution history image</u>. For the reasons discussed with respect to claim 1, the applicant respectfully submits that the rejection of claim 6 is traversed.

Because claim 7 depends on claim 6, the applicant respectfully submits that the objection of the claim is also traversed.

Claim 8 recites:

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8. An apparatus comprising:

a processor;

a memory connected to said processor;

an executable software program residing in said memory; and

an operating system residing in said memory and executing on said processor, wherein said operating system comprises a software module for:

dividing an executable software program in memory into an executable image, a data image, and an execution history image; and

classifying a first statement in said execution history image into one of a mutable statement and an immutable statement.

(*emphasis supplied*)

Nowhere does Narayanan teach or suggest, alone or in combination with the other references, what claim 8 recites – namely <u>a memory</u>, in which an operating system resides that comprises a software module for <u>dividing an executable software program into an executable image, a data image, and an execution history image</u>. For the reasons discussed with respect to claim 1, the applicant respectfully submits that the rejection of claim 8 is traversed.

Because claims 9 through 12 depend on claim 8, the applicant respectfully submits that the rejection of claims 9 and 12 and the objection of claim 10 and 11 are also traversed.

Claim 13 recites:

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13. An apparatus comprising:

a processor;

a memory connected to said processor;

an executable software program residing in said memory; and

an operating system residing in said memory and executing on said processor, wherein said operating system comprises a software module for:

*dividing an executable software program in memory into an executable
image, a data image, and an execution history image*; and

executing a statement in said executable image, wherein said executing further comprises executing data write-backs and data read-backs in said data image, and wherein said data image is accessed using a computed offset into said data image from said executable image.

(*emphasis supplied*)

Nowhere does Narayanan teach or suggest, alone or in combination with the other references, what claim 13 recites – namely <u>a memory,</u> in which an operating system resides that comprises a software module for <u>dividing an executable software program into an executable image, a data image, and an execution history image</u>. For the reasons discussed with respect to claim 1, the applicant respectfully submits that the rejection of claim 13 is traversed.

Because claim 14 depends on claim 13, the applicant respectfully submits that the rejection of claim 14 is also traversed.

Claim 15 recites:

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15. An apparatus comprising:

a host computer comprising a memory and a processor;

an executable software program residing in said memory; and

an operating system residing in said memory and executing on said processor, wherein said operating system comprises a software module for:

       dividing an executable software program in memory into an executable
         image, a data image, and an execution history image; and

       classifying a first statement in said execution history image into one of
         a mutable statement and an immutable statement.

(*emphasis supplied*)

Nowhere does Narayanan teach or suggest, alone or in combination with the other references, what claim 15 recites – namely <u>a host computer comprising a memory</u>, in which an operating system resides that comprises a software module for <u>dividing an executable software program into an executable image, a data image, and an execution history image</u>. For the reasons discussed with respect to claim 1, the applicant respectfully submits that the rejection of claim 15 is traversed.

Because claims 16 through 19 depend on claim 15, the applicant respectfully submits that the rejection of claims 16 and 19 and the objection of claim 17 and 18 are also traversed.

Claim 20 recites:

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20. An apparatus comprising:

a host computer comprising a memory and a processor;

an executable software program residing in said memory; and

an operating system residing in said memory and executing on said processor, wherein said operating system comprises a software module for:

> *dividing an executable software program in memory into an executable image, a data image, and an execution history image*; and
>
> executing a statement in said executable image, wherein said executing further comprises executing data write-backs and data read-backs in said data image, and wherein said data image is accessed using a computed offset into said data image from said executable image.
>
> (*emphasis supplied*)

Nowhere does Narayanan teach or suggest, alone or in combination with the other references, what claim 20 recites – namely <u>a host computer comprising a memory</u>, in which an operating system resides that comprises a software module for <u>dividing an executable software program into an executable image, a data image, and an execution history image</u>. For the reasons discussed with respect to claim 1, the applicant respectfully submits that the rejection of claim 20 is traversed.

Because claim 21 depends on claim 20, the applicant respectfully submits that the objection of claim 21 is also traversed.

Claim 22 recites:

> **22.** A machine-readable medium comprising a software module for:
>
> *dividing an executable software program in memory into an executable image, a data image, and an execution history image*; and
>
> classifying a first statement in said execution history image into one of a mutable statement and an immutable statement.
>
> (*emphasis supplied*)

Nowhere does Narayanan teach or suggest, alone or in combination with the other references, what claim 22 recites – namely a machine-readable medium that comprises a software module for <u>dividing an executable software program into an executable image, a data image, and an execution history image</u>. For the reasons discussed with respect to claim 1, the applicant respectfully submits that the rejection of claim 22 is traversed.

Because claims 23 through 26 depend on claim 22, the applicant respectfully submits that the rejection of claims 23 and 26 and the objection of claim 24 and 25 are also traversed.

Claim 27 recites:

> **27.** A machine-readable medium comprising a software module for:
>
> dividing an executable software program in memory into an executable image, a data image, and an execution history image; and
>
> executing a statement in said executable image, wherein said executing

> further comprises executing data write-backs and data read-backs in said data image, and wherein said data image is accessed using a computed offset into said data image from said executable image.
>
> (*emphasis supplied*)

Nowhere does Narayanan teach or suggest, alone or in combination with the other references, what claim 27 recites – namely a machine-readable medium that comprises a software module for <u>dividing an executable software program into an executable image, a data image, and an execution history image</u>. For the reasons discussed with respect to claim 1, the applicant respectfully submits that the rejection of claim 27 is traversed.

Because claim 28 depends on claim 27, the applicant respectfully submits that the objection of claim 28 is also traversed.

Request for Reconsideration Pursuant to 37 C.F.R. 1.111

Having responded to each and every ground for objection and rejection in the Office action mailed January 12, 2007, applicant respectfully requests reconsideration of the instant application pursuant to 37 CFR 1.111 and request that the Examiner allow all of the pending claims and pass the application to issue.

If there are remaining issues, the applicant respectfully requests that Examiner telephone the applicant's attorney at 732-578-0103 x12 so that those issues can be resolved as quickly as possible.

Respectfully,
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